Compensating for nuclear accidents in Japan: the Fukushima case

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1. Introduction[1]

On 11 March 2011 a 9.0 magnitude earthquake hit the coast of Japan leading to a spectacular tsunami. Already the death toll of the tsunami itself made it one of the worst natural disasters in the Japanese history.[2] In the aftermath of the tsunami a second catastrophe hit Japan, since the Fukushima nuclear power plant was located in the region of the tsunami (Töhoku), merely 150 kilometres away from the epicentre of the earthquake. A 13-15m maximum height tsunami followed the earthquake and arrived at Fukushima, which topped the plant's 5.7m seawall and lead to the failure of the cooling system.[3] The equipment failures resulted in core melt down and releases of radioactive materials. The severity of the nuclear accident is rated 7 on the International Nuclear Event Scale (INES),[4] the same as the Chernobyl disaster which took place on the 26th of April 1986.

This has lead to a strange combination of a natural and a technological disaster. Whereas nuclear incidents are usually referred to as technological (or man made) disasters this time the technological disaster was triggered by a natural disaster (the earthquake and the subsequent tsunami). This raises important questions with respect to the compensation of the victims. In this article we will focus on how the victims of Fukushima nuclear accidents are compensated and how the liability system can contribute to prevention as well. An important question which will of course arise from a legal perspective is to what extent the earthquake and following tsunami could be considered as a force majeure which would exclude the liability of the operator of the nuclear power plant. This requires a detailed analysis of the compensation system for nuclear damage in Japan. The compensation for nuclear damage in Japan has a few interesting characteristics (like unlimited liability and indemnity agreements with the government) which make a further study of this model highly interesting, also from an international perspective. Also the fact that it is difficult to identify whether it was (only) the tidal wave following the earthquake which caused the nuclear incident or also human error raises interesting questions from a legal perspective.

This paper is structured as follows: after this introduction (1) the applicable liability rules are sketched according to the Act on Compensation for Nuclear Damage of 1961 (2). Then the financing of the nuclear damage via various arrangements is discussed (3) and this is followed by the way in which victims are compensated in the recent Fukushima incident (4). A brief critical evaluation (5) and a comparison to the international regime (6) are provided. Section 7 concludes.

2. Liability rules

2.1 Nuclear Energy in Japan

Nuclear energy is an important energy source in Japan. It is reported that as of the end of Fiscal Year (FY) 2009, 54 commercial nuclear power plants are operating in Japan with a total licensed generating capacity of 48,847 Mwe. That was approximately 20% of the total capacity of electric power generation.[5]

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2 The Japanese National Police Agency has confirmed that by the end of 2011 there were 15,457 casualties, 5,349 injured and 7,676 persons missing as well as over 125,000 buildings damaged or destroyed. *See* Japanese National Police Agency, *Damage Situation and Police Countermeasures associated with 2011 Tohoku district – off the Pacific Ocean Earthquake*, http://www.npa.go.jp/archive/keibi/biki/higaijokyo_e.pdf (last visited Mar. 10, 2012); Japanese National Police Agency, 平成 2 年(2011 年)東北地方太平洋沖地震の被害状況と警察措置 The Damage of Tōhoku Earthquake of 2011, http://www.npa.go.jp/archive/keibi/biki/higaijokyo.pdf (last visited Mar. 10, 2012).

3 http://www.google.com/hostednews/ap/article/ALeqM5gLKi4UhOU2O4nxE_GI6ojeeTPU4A?docId=4212f388029744c98fc86d18476fd974. (last visited Mar. 10, 2012).

4 The INES was introduced in 1990 by the International Atomic Energy Agency (IAEA) to communicate to the public the safety significance of nuclear and radiological events. The INES scale explains the significance of events arising from a range of activities, such as the industrial and medical use of radiation sources, operations at nuclear facilities and transport of radioactive material. Events are classified on the scale at seven levels. The severity of an event is about ten times greater for each increase in level on the scale. See the website of IAEA: http://www.iaea.org/Publications/Factsheets/English/ines.pdf (last visited Mar. 10, 2012).

5 See the website of Japan Nuclear Energy Safety Organization, http://www.jnes.

In a country like Japan, where nuclear energy plays an important role, it is interesting to see how the liability system works to prevent and compensate nuclear damage. Japan does not participate in any international convention on civil liability for nuclear damage.[6] Japan at the time did not feel the need to join the international conventions, since also other major nuclear powers (like the US and more recently India and China) were not party to the international nuclear liability conventions either.[7] It established its own national regime through four major legislative instruments: the Act on Compensation for Nuclear Damage (Act on Compensation), the Order for the Execution of the Act on Compensation for Nuclear Damage (Order on Compensation), the Act on Indemnity Agreement for Compensation of Nuclear Damage (Act on Indemnity) and the Order for the Execution of the Act on Indemnity Agreement for Compensation of Nuclear Damage (Order on Indemnity).[8] A number of principles of the international third party liability regimes are also embodied in those legislations.[9]

2.2 The Act of 1961

The Act on Compensation for Nuclear Damage of 1961 (2009) shapes the major structure of the liability rules for nuclear damage and the corresponding financial requirements. The Act on Compensation was initially passed in 1961 and recently amended in 2009. Many different kinds of activities were covered under the Act: reactor operation, production, reprocessing, the use of nuclear fuel, storage of spent fuel, and waste disposal of nuclear fuel or material contaminated by nuclear fuel.[10] The scope of the nuclear operation is quite broadly defined: not only nuclear reactors, but also many other facilities in the nuclear cycle are covered. The Japanese law is the result of a careful compromise between the interests involved which is also made clear in Article 1 of the Act which holds that the Act aims both at the protection of victims as well as at the promotion of the further development of nuclear energy.[11]

2.3 Nuclear Damage

The Act on Compensation stipulates liability for nuclear damage. The term "nuclear damage" is defined as "any damage caused by the effects of the fission process of nuclear fuel, or of the radiation from nuclear fuel etc. or of the toxic nature of such materials".[12] This is broader than the US nuclear liability regime. In the US, the Price-Anderson Act imposes the "public liability" for nuclear damage, which means "any liability arising out of or resulting from a nuclear incident or precautionary evacuation".[13] Under the Japanese regime, there is no requirement of a sudden incident. In other words, either damage caused by a nuclear incident or gradual damage can be covered under the Act on Compensation.

2.4 Channelled Strict Liability

As in the international regime, a strict liability regime for nuclear damage is established in Japan, and the liability is channeled to the nuclear operator.[14] However, if the damage is caused by the wilful act of a third party, the operator who has compensated the damage has a right of recourse against the third party. Moreover, a nuclear operator can enter in to a special agreement with any person regarding rights of recourse.[15] In other words, through a special contractual arrangement, a nuclear operator has the possibility to recover the damage from the contractors who actually contributed to the risks. If the nuclear damage is caused by a grave natural disaster of an exceptional character or by an insurrection, the nuclear operator can be exonerated from liability.[16] The term "an exceptional character" is essential to determine the exoneration of liability. Nuclear operators can still be held liable for the nuclear damage caused by some natural disaster, such as earthquake or volcanic eruption. He can cover such losses through an indemnity agreement with the government. In the other words, if the natural disasters cannot be iden-

go.jp/english/activity/unkan/e-unkanhp1/e-unkanhp1-2010/book1/book.pdf (last visited Mar. 10, 2012).

6 Julius Weitzdörfer, 'Die Haftung für Nuklearschäden nach japanischem Atomrecht – Rechtsprobleme der Reaktorkatastrofe von Fukushima I', *Zeitschrift für Japanisches Recht* 31, *Journal of Japanese Law*, 61, 67 (2011) [*Liability for Nuclear Damages pursuant to Japanese Atomic Law – Legal Problems Arising from the Fukushima I Nuclear Accident*].

7 Telephone Interview with Kunihiko (Kuni) Shimada, special advisor to the minister of the environment in Japan and chief executive officers of KS International Strategies Inc. (Dec. 26 2011).

8 Copies of English translation can be found at the website of NEA, see http://www.oecd-nea.org/law/legislation/japan.html (last visited Mar. 10, 2012).

9 The major principles underlying the international nuclear liability conventions contain: strict liability, channeling of liability to the nuclear operator, limited liability, compulsory insurance, exclusive jurisdiction and public funding. For the details of those principles, *see* Tom Vanden Borre, 'Nuclear Liability: an Anachronism in EU Energy Policy?' In: *European Energy Law Report VII*, p. 184 (Martha M. Roggenkamp & Ulf Hammer eds., 2010). Some of those principles are followed in Japanese nuclear law, such as strict liability, channeling of liability and compulsory financial coverage. The major difference is that unlimited liability applies in the Japanese system. The details of those features are discussed in the following section.

10 Act on Compensation for Nuclear Damage (Act No. 147 of 1961), As Amended by Act No. 19 of 17 April 2009 [Act on Compensation 2009], Section 2(1).

11 Weitzdörfer, *supra* note 5, at p. 67-68.

12 Act on Compensation, Section 2 (2).

13 42 U.S.C.A. § 2014 (w).

14 Section 3 of the Act of 1961 makes clear that when nuclear damage occurs, the nuclear operator who is engaged in the reactor operation shall be liable for the damage. The title mentions that it is a "liability without fault". Section 4 holds a channelling provision which is formulated as follows: "Where nuclear damage is covered by the preceding section, no other person other than the nuclear operator who is liable for the damage pursuant to the preceding section shall be liable for the damage". See further Weitzdörfer, *supra* note 5, at p. 68 and 70.

15 Act on Compensation, section 5.

16 Act on Compensation, section 3.

tified as of an exceptional nature, the operators are still liable. Since insurers usually exclude the damage caused by natural disasters from liability insurance policies, this kind of risk is covered by an indemnity agreement concluded with the government.[17]

2.5 Limits and Dispute Reconciliation Committee

A major difference between the Japanese regime and the international regime is that in Japan the liability of the nuclear operator is unlimited.[18] Although there is a ceiling for the requirement of financial security that has to be provided by the operator, he is still liable for damage in excess of this ceiling. The details of the financial security are discussed in the following subsection.

In case of a nuclear accident, the Dispute Reconciliation Committee for Nuclear Damage Compensation (hereinafter Reconciliation Committee) may be established as an organization attached to the Minister for Education, Culture, Sport, Science and Technology (MEXT). The Reconciliation Committee "shall be in charge of mediating reconciliation of any dispute arising from compensation of nuclear damage and of preparing general instructions to help operators reach a voluntary settlement of such disputes".[19] To establish such a Reconciliation Committee is a usual practice in Japan in compensating nuclear damage. For example, after both the Tokai-Mura Accident in 1999 and the Fukushima accident, a Reconciliation Committee was established to deal with the compensation.[20]

3. Financing of the Compensation

Nuclear damage may turn out to be catastrophic, which can dwarf the financial capacity of the liable operators. Thus financial security provided by operators can be used to guarantee the availability of a certain level of assets in case of damage. The Act on Compensation imposes obligations on the nuclear operators to provide financial security up to a certain level.[21] The financial security is set from 4 billion yen to 120 billion yen, depending on different types of installations. For the nuclear power plants, the amount is set as 120 billion yen.[22] The operator can satisfy his financial obligation by using a contract of liability insurance for nuclear damage, an indemnity agreement (with the government) or a deposit approved by MEXT. If the damage exceeds the amount available from financial security mechanisms, the government can have the option to provide aids. The use of liability insurance, the indemnity agreement and governmental aids is now discussed respectively.

3.1 Liability Insurance

Liability insurance is the primary instrument to provide financial security for nuclear damage in Japan. The contract of liability insurance for nuclear damage is defined as "the contract under which an insurer undertakes to indemnify a nuclear operator for his loss arising from compensating nuclear damage, where the nuclear operator becomes liable for such nuclear damage".[23] A nuclear accident has the potential to create catastrophic losses and the amount of financial security required from nuclear operators is also too large for a single insurance company. Therefore, as is also the practice in other countries, the insurers in Japan have pooled together to provide insurance coverage for nuclear risks. The nuclear liability insurance policy is provided by the Japan Atomic Energy Insurance Pool (JAEIP). The pool was established in 1960 and is comprised of 32 domestic insurance companies and 11 foreign insurance companies. Different from the American nuclear pools, JAEIP provides both a liability insurance policy and property damage policies.[24]

Under the liability policy provided by the JAEIP, the coverage contains: compensation for nuclear damage, legal expenses (including costs for litigation, arbitration, settlement and mediation, which is approved by the insurer), the costs of preservation of rights and the costs of measures to prevent the expansion of damage.[25] The insurance policy excludes a few kinds of damage: the damage caused intentionally by the insured, a grave natural disaster of an exceptional character or by an insurrection, the use of atomic energy for non-peaceful purpose, earthquake, fire or tsunami; damage to the property owned, used or managed by the insured, damage to other property which is located at the site of the used in connection with the insured's facility.[26]

17 See Act on Indemnity Agreements for Compensation of Nuclear Damage (Act No. 148 of 1961), As Amended by Act No. 19 of 17 April 2009, Section 3.
18 Weitzdörfer, *supra* note 5, at p. 70-71.
19 Act on Compensation, section 18 (1).
20 On the Tokai-mura accident, *see* Secretariat of the OECD Nuclear Energy Agency, 'Tokai-Mura Accident, Japan, Third Party Liability and Compensation Aspects', in: *Indeminification of damage in the event of a nuclear accident*, p. 127, 129 (OECD, 2003). For the Fukushima accident, *see* the website of Japanese Ministry of Economy, Trade and Industry, http://www.meti.go.jp/english/earthquake/nuclear/pdf/20110512_provisional_payment_1.pdf (last visited Mar. 10, 2012).
21 Act on Compensation, section 6.
22 Act on Compensation, section 7.1; Order on Compensation, section 2.
23 Act on Compensation, section 8.
24 大羽宏一, 原子力災害と原子力損害賠償責任保, 大分大学経済論集 51(6), 21-47, 30. [Oba Hirokazu, 'Nuclear Damage and Liability insurance for Nuclear damage', p. 51, in: *Otia University Economic Review*, 21, 30 (2000)].
25 Liability insurance for nuclear installations, common clause, 2000 (Clause 2000), Article 3. As cited in Oba Hirokazu (2000), *supra* note 23, at p. 33.
26 Clause 2000, article 7.

3.2 Indemnity Agreements

To compensate for the damage which is not covered by liability insurance or other means of financial security, a nuclear operator can conclude an indemnity agreement with the government. The Act on Indemnity Agreements for Compensation of Nuclear Damage (the Act on Indemnity Agreements) and the Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage (the Order on Indemnity Agreements) lay down the rules for indemnity agreements.

Nuclear damage caused by natural disasters is less predictable for insurers. Therefore it is excluded from insurance coverage in Japan. Besides, nuclear damage has a long tail feature: sometimes the damage only appears decades after the accident and exposure to radiation. The long tail characteristic poses a challenge to the insurance market, which often only covers damage that happens within ten years after the occurrence of the nuclear event. This is also the case in Japan.[27] However, in Japan, the prescription period is 20 years after the data on which the tort occurred.[28] Damage caused by natural disaster and damage claimed beyond a period of ten years from the day of the occurrence of an event are covered in the indemnify agreements. In addition, the indemnity loss contains also nuclear damage caused by the normal operation and other damage provided in the Cabinet Order.[29] Other damage provided in the Cabinet Order refers to the damage resulting from a tidal wave. In other words, the damage resulting from a tidal wave is not covered by insurance, but it is covered under the indemnity agreement with the government.[30]

The indemnity agreement amount should be the required amount of the financial security (reduced by the amount available by other means or other indemnity agreements).[31] The period of the indemnity agreement is from the time of its conclusion to the time when the reactor operation has ceased.[32] To seek the coverage of an indemnity agreement, the operator has to pay an indemnity fee as the price. The indemnity fee is determined by multiplying the indemnity agreement amount by the rate provided in the Order. According to the order that rate shall be 3 (indemnity fee) for 10, 000 (amount being indemnified) or 1.5 for 10, 000 for the reactor in universities and technical colleges. The rate can be increased *ex post* by the government if the amount available for indemnifying is insufficient at the time the indemnity fee is paid.[33] The operators are imposed an obligation to notify the government of some specific issues.[34] The government has the right to cancel the indemnity agreement if the operators violate certain regulatory obligations.[35]

3.3 Government Aid

The Act on Compensation requires operators to provide financial security up to the amount of 120 billion yen. However, a catastrophic nuclear damage can turn out to lead to much higher damage than that amount. When such damage happens, the government shall give a nuclear operator aid needed for compensation if the government deems it necessary. Such aid should be given to the extent authorized by the National Diet.[36] When the damage is caused by a grave natural disaster of an exceptional character or by an insurrection, the government shall take the necessary steps to relieve victims and to prevent the damage from spreading.[37] Unlike under the indemnity agreement, under which the actual rights and obligations of the government and the operator have been clearly established and the indemnity amount is determined *ex ante*, how aid will be arranged in these cases is not clear and is to a large extent determined *ad hoc* by the government. Besides, the operators do not have to pay a price for such aids.

The compensation system, also taking into account the case of a natural disaster, can hence be summarized as follows:

27 Clause 2000, article 8.
28 Civil Code (Act No. 89 of 1896), section 724. Unofficial English translation available at: http://www.tomeika.jur.kyushu-u.ac.jp/transaction/legislation/civil_code.pdf (last visited Mar. 10, 2012).
29 Act on Indemnity, section 3.
30 Order on Indemnity, section 2.
31 Act on Indemnity, section 4.
32 Act on Indemnity, section 5.
33 Order on Indemnity, section 3.
34 Different notification requirements are set for different kinds of indemnity agreements, such as for the indemnity agreement relating to reactor operation, that relating to production, reprocessing, the use of nuclear fuel, and so on. For example, in the indemnity agreement relating to the reactor operation, the nuclear operator needs to notify the Government the following issues: the use of the nuclear reactor, type, the thermal rating and number of nuclear reactors; name and address of the installations or sites equipped with a nuclear reactor; location, structure and equipment of the building housing the nuclear reactor, types and quantity of the nuclear materials to be used as fuel in the nuclear reactor; method of disposing of spent fuel and information about the liability insurance contract. *See* Order on Indemnity, section 4.
35 Act on Indemnity, section 15; Order on Indemnity, section 9.
36 Act on Compensation, section 16.
37 Act on Compensation, section 17.

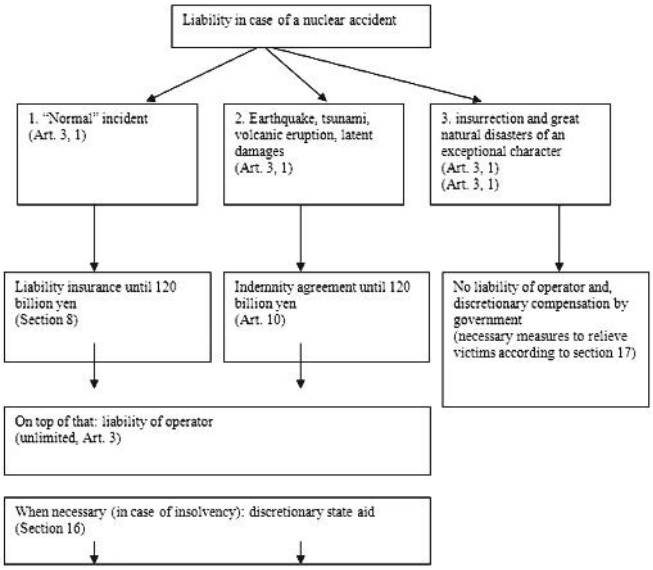

Table 1: Liability in case of a nuclear accident in Japan[38]

4. Case Study: the Fukushima Accident

4.1 A Brief Introduction to the Fukushima Disaster

The Fukushima I Nuclear Power Plant is a plant consisting of six boiling water reactors which are designed by General Electric (GE), and maintained by the Tokyo Electric Power Company (TEPCO). After the 9.0 magnitude earthquake hit Japan on 11 March 2011, the reactors Units 1, 2 and 3 were shut down automatically. The other three units had been shut down prior to the earthquake for planned maintenance. After the shutdown of the nuclear reactors, there was still decay heat from the radioactive decay of the unstable isotopes. Nuclear fuel rods require several years of water cooling in a spent fuel pool before decay heat production reduces to the point that they can be safely transferred to dry storage casks.[39] Cooling pumps can be powered by other units on-site, by other units of-site through the grid or by diesel generators or steam-turbine driven emergency core cooling systems to circulate cooling water when the reactor is shut down. After the 11 March earthquake and the following tsunami, the plant stopped generating electricity, stopping the normal source of power. The tsunami lead to a flood in the basement of the Turbine Buildings and disabled the emergency diesel generators located there.[40] The failure of the cooling system subsequently led to the full meltdown in reactors 1, 2 and 3. A series of accidents was reported in the following weeks, including hydrogen explosions and leaking of cooling water.[41] GE has been criticized for its design, that is vulnerable to earthquake and flooding risks. According to the design, the reactor's energy diesel generators and DC batteries were located in the basements of the reactor turbine buildings, which was flooded because of the tsunami. It was reported that mid-level engineers working on the construction of the plant were concerned with the vulnerability to floods of the back up power systems.[42] It is also reported that GE was warned of the major design flaws in 1976.[43] TEPCO chose to follow GE's design in the construction strictly. To comply with new regulatory requirements, three additional backup generators were placed in the building located high in the late 1990s. However, the switching stations that connect the generators and reactors cooling systems were still in poorly protected turbine buildings. It is argued that if the switching stations had been moved inside the reactor buildings, the failure of the cooling system would not have happened.[44] How the nuclear damage resulting from this catastrophe will be compensated raises serious concerns.

4.2 The Scope of Compensable Damage

The nuclear accident developed quickly in the early weeks after the earthquake and tsunami. The nuclear accident led to substantial third party damage. According to the Act on Compensation, the nuclear operator faces unlimited strict liability and he has the obligation to seek financial security up to 120 billion yen. If the damage is caused by an earthquake or volcanic eruption, the government should indemnify the loss until it reaches 120 billion yen through the indemnity agreement with government. For damage in excess of this amount, the operator is still liable. However, if such a natural disaster is determined as "a grave natural disaster of an exceptional character", the liable parties can be exonerated from liability. To apply those liability rules to the Fukushima accident, whether TEPCO will face substantial liability depends on whether the accident will be attributed to "a grave natural disaster of an exceptional character".[45]

38 Weitzdörfer, *supra* note 5, at p. 75.

39 http://www.somdnews.com/stories/03232011/rectop133917_32384.shtml. (last visited Mar. 10, 2012).

40 http://en.wikipedia.org/wiki/Fukushima_Daiichi_nuclear_disaster#cite_ref-41 (last visited Mar. 10, 2012).

41 http://en.wikipedia.org/wiki/Fukushima_Daiichi_nuclear_disaster#cite_ref-41 (last visited Mar. 10, 2012).

42 http://search.japantimes.co.jp/cgi-bin/nn20110713x1.html (last visited Mar. 10, 2012).

43 http://en.wikipedia.org/wiki/Fukushima_Daiichi_nuclear_disaster#cite_ref-41 (last visited Mar. 10, 2012).

44 Norihiko Shirouzu & Chester Dawson, *Design Flaw Fueled Nuclear Disaster*: http://online.wsj.com/article/SB10001424052702304887904576395580035481822.html (last visited Mar. 10, 2012).

45 The issue of whether the Fukushima incident considered such a grave natural disaster of an exceptional character is as yet undecided. See Weitzdörfer, *supra* note 5, at p. 76-77. Some hold that TEPCO was aware of the danger of an earthquake which could lead to a nuclear incident since several experts had provided warnings in that respect. This would be an argument to hold that the earthquake had no exceptional character. On the other hand, the earthquake with a magnitude of 9.0 was the strongest so far in Japan as a result of which the question could arise what would then still be necessary to qualify as "a grave natural disaster of an exceptional character".

The Japanese government did not admit the earthquake and tsunami to be of an "exceptional character". On the contrary, the government requires TEPCO to compensate the damage it caused. Several provisional payments of nuclear damage compensation have been made by TEPCO until now.[46] To investigate the impact of the Fukushima accident and ascertain the compensable damage, the Dispute Reconciliation Committee for Nuclear Damage Compensation has been established. The Reconciliation Committee has published a preliminary guidance, secondary guidance with an added guidance, and interim guidance with an added guidance on the scope of compensable damage.[47] It defined the compensable damage according to territorial zones. The determination of compensable damage also took into account the compensation for the Tokai-mura accident and whether the compensable losses were similar.[48] According to the government guidance, TEPCO also stipulates the standards for compensation for those different categories.[49]

It is worth noting that the compensable damage determined by the Dispute Reconciliation Committee in Japan is quite broad. It does not only allow compensation for personal damage and property damage but also for some pure economic loss. For example, under the title of business damage, damage due to rumors and indirect damage, physical damage is not a necessary requirement for awarding damages. In response to the nuclear damage, Japan chose an administrative system rather than a judicial system as the primary compensation instrument. Compensation is awarded according to different areas and government orders. The standards to indentify compensable losses are also set by the administrative authority. This approach can avoid the substantial hurdles in the tort system in awarding compensation for nuclear damage. Though in the Act on Compensation no specific hurdles have been introduced in the establishment of nuclear liability, some general obstacles in the tort system may still prevent sufficient compensation for nuclear victims. For example, in Japanese law, there is no general rule which bars the recovery of pure economic loss. However, in practice the claim for pure economic loss is not easy, either because of the difficulties in proving negligence or because of the remoteness of the economic loss.[50] Besides, even for personal injury, the causation is not always easy to be established due to scientific uncertainties. Those hurdles may not be easy to overcome in the tort system, but can be easier solved in the administrative system.

In addition to personal injury, property damage and economic losses which often draw more attention in case of a nuclear accident, serious environmental damage can also arise from such an accident. The building, soil and vegetation may be exposed to high radiation spread by the accident and create a further threat for human health. The Fukushima accident is classified as INES level 7, which means that it creates significant off site impacts and environmental damage. However, as shown above, the compensable damage determined by the Dispute Reconciliation Committee makes no direct reference to the concept "environmental damage".

A specific act was enacted on August 26, 2011 to address the decontamination of the damaged environment: the "Act on Special Measures concerning the Handling of Environmental Pollution by Radioactive Materials Discharged by NPS Associated with the Tohoku District-Off the Pacific Ocean Earthquake that Occurred on March 11, 2011".[51] The act gives a framework of decontamination measures for the pollution caused by the Fukushima accident with the involvement of national government, local government and nuclear operators. It is worth noting that rather than restoring and compensating for the damage to the environment itself, this act focuses on reducing the influence of environmental pollution on human health and the living environment.[52] In the other words, this act does not aim at providing complete compensation for the environment; only the measures related to reducing human impacts are covered. The national government is responsible for setting decontamination policies and take measures itself. Local governments shall cooperate with the national government and shall also take some initiatives themselves. Nuclear operators shall dispose the radioactive wastes and cooperate with the government to decontaminate the polluted environment. The financial duty to take care of the decontamination of the polluted environment is formulated in the recent act as an obligation of various stakeholders.[53] The act *inter alia* provides that national government and local public authorities shall take financial measures and other measures to pro-

46 http://www.meti.go.jp/english/earthquake/nuclear/roadmap/pdf/20110614_damage_corporation_2.pdf (last visited Mar. 10, 2012).

47 The preliminary guidance was made on 28th April; the secondary guidance was made on 31st May, and added guidance was made on 20th June, interim guidance was made on 5th of August, and the added guidance on interim guidance on 6th of December. For the content of guidance (Japanese), *See* http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/index.htm(last visited Mar. 10, 2012).; http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/shiryo/__icsFiles/afieldfile/2011/12/06/1313895_1_1.pdf (last visited Mar. 10, 2012).

48 Interim Guidance on the Determination of Compensation Scope for Fukushima Accident, available: http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/houkoku/__icsFiles/afieldfile/2011/08/17/1309452_1_2.pdf (last visited Mar. 10, 2012).

49 http://www.tepco.co.jp/en/press/corp-com/release/betu11_e/images/110830e19.pdf; http://www.tepco.co.jp/en/press/corp-com/release/betu11_e/images/110921e13.pdf (last visited Mar. 10, 2012).

50 Yoshihisa Nomi, 'Tort Liability for Pure Economic Loss in Japan', in: *Japanese Reports for the XVII International Congress of Comparative Law*, (Utrecht, 16-22 July 2006), available at: http://www2.law.uu.nl/priv/AIDC/PDF%20files/IIA5/IIA5%20-%20Japan.pdf (last visited Mar. 10, 2012).

51 http://www.mext.go.jp/b_menu/shingi/chousa/kaihatu/016/shiryo/__icsFiles/afieldfile/2011/09/21/1311103_13_2.pdf (last visited Mar. 10, 2012).

52 Article 1.

53 *See* articles 43-45 of the Act on Special Measures concerning the handling of environmental pollution by radioactive materials discharged by MPS associated with the Tohoku-district of the Pacific Ocean earthquake that occurred on March 11, 2011.

mote the policies related with the handling of the environmental pollution by radioactive materials discharged by the accident. However, the act equally makes clear that also the liable nuclear operators shall compensate within their capacity. Experts on nuclear law in Japan also confirm that on the basis of the new act the financing of the decontamination is considered as a joint responsibility of the operators, the national government and local public authorities.[54]

4.3 Financing of the Compensation

Besides the scope of compensable damage, another related question is how this catastrophic damage can be financed. As was indicated above, nuclear damage caused by a natural disaster is excluded from the insurance policy provided by JAEIP. Thus the insurance industry does not seem to be seriously impacted by this accident. The government may have to indemnify the losses up to 120 billion yen. However the remainder of the damage may still create a challenge to the financial capacity of TEPCO. According to the Act on Compensation, if the operator's liability exceeds the amount of financial security and the government deems it necessary in order to attain the objectives of the act, the government shall give aid to the operator.[55] The aid typically includes financial assistance such as a subsidy, low-interest special loans and interest aids. However, whether and to which extent aids will be given depends on the government's decision. Since the significant impact of the Fukushima accident and the catastrophic nature of the damage, it will be difficult for TEPCO alone to provide full compensation. To ensure a prompt compensation of the damage caused by the Fukushima accident, the government has prepared an Act on compensation since June 2011. The Act to Establish Nuclear Damage Compensation Facilitation Corporation was passed on 3 August, 2011.[56] The act has three aims: ensuring the prompt and proper nuclear damage compensation for affected people, stabilization of the nuclear power station and the prevention of adverse effects on business operators and the stable supply of electricity.[57] To realize those aims, the act establishes a nuclear damage compensation facilitation corporation (the Corporation) and a system of financing the compensation for damage. The Corporation will receive contributions from nuclear operators as the cost required for the operation of the Corporation, and reserve funds in preparation for compensation.[58] The victims still need to claim from the liable operator and the liable operator needs to make the payment to the victims. However, the Corporation can facilitate the compensation and provide the necessary information and advice in response to the affected people's consultation.[59] If the liable operator needs assistance, the Corporation can provide two forms of assistance: the ordinary financial assistance which needs the resolution of the management committee of the Corporation, and special financial assistance which needs to be approved by the competent minister. Under the special financial assistance, the Corporation and the operator need to formulate a special business plan. Under this plan, the government will issue government bonds to the Corporation and the Corporation will grant the necessary funds to the nuclear operator. The Corporation can also get support from financial institutions, which can be guaranteed by the government. After getting the financial support from the government and financial institutions, the liable nuclear operator will pay special contributions to the Corporation. Other nuclear operators also need to pay general contributions based on the principle of "mutual support". From the contributions, the corporation will make repayments to the national treasury and financial institutions. One issue worth noting here is that the Corporation does not only provide assistance for the compensation of third party damage, but also for the expenditures to deal with the nuclear disaster and facility investment to sustain a stable supply of electricity.[60] The compensation under the new system can be summarized as follows:

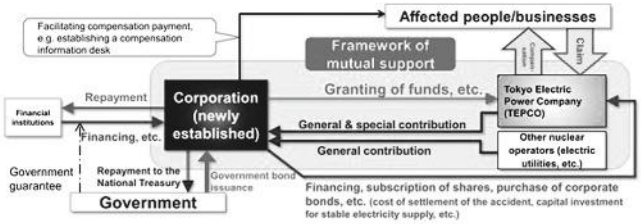

Table 2: Compensation support by Nuclear Damage Compensation Facilitation Corporation[61]

54 Telephone interview with Mr. Kuni Shimada (Dec. 26, 2011).

55 Act on Compensation, section 16.

56 Japan's parliament approves TEPCO compensation plan, http://www.bbc.co.uk/news/business-14383832 (last visited Mar. 10, 2012);English summary of the act: Outline of the bill of the Act to Establish Nuclear Damage Compensation Facilitation Corporation (tentative), http://www.meti.go.jp/english/earthquake/nuclear/roadmap/pdf/20110614_damage_corporation_2.pdf (last visited Mar. 10, 2012); Outline of the bill of the Act to Establish Nuclear Damage Compensation Facilitation Corporation , http://www.meti.go.jp/english/earthquake/nuclear/roadmap/pdf/20110614_damage_corporation_1.pdf (last visited Mar. 10, 2012); Full content of the act (Japanese): http://www.meti.go.jp/earthquake/nuclear/taiou_honbu/pdf/songaibaisho_110614_03.pdf (last visited Mar. 10, 2012).

57 The Act to Establish Nuclear Damage Compensation Facilitation Corporation, article 1.

58 Outline of the bill of the Act to Establish Nuclear Damage Compensation Facilitation Corporation, supra note 55, p. 1.

59 Id, p. 3.

60 Outline of the bill of the Act to Establish Nuclear Damage Compensation Facilitation Corporation (tentative). Outline of the bill of the Act to Establish Nuclear Damage Compensation Facilitation Corporation, *supra* note 55.

61 http://www.meti.go.jp/english/earthquake/nuclear/roadmap/pdf/20111012_nuclear_damages_1.pdf (last visited Mar. 10, 2012).

This act established a mutual support pooling system to provide coverage for nuclear liability after the Fukushima accident. Pooling has been advised by some scholars as a useful instrument to finance the catastrophic losses and at the same time not to dilute the preventive incentives.[62] However, the mutual support system established in Japan has some characteristics different from the practice in other Jurisdictions. In both Germany and the US, where a pooling between nuclear operators has been established, the pooling was made before an accident happened. However, the ex post established system can not create incentives among operators to monitor each other. Moreover, under the Japanese system, the Corporation is not only financed by nuclear operators, but also through government compensation bonds and government guaranteed bonds. If those funds are financed without a market price, this system will be more like a bailout of TEPCO rather than a pooling system to prevent and compensate for future damage. It has to be admitted that this plan has lead to much criticism: some doubt that if the government support is not registered as a loan on TEPCO's balance sheet, the tax payers will ultimately bear the risk; there is also concern about nuclear safety which may be compromised as a price for cutting costs for TEPCO in the following years.[63] Others even doubt whether TEPCO is still worth continuing to exist at all.[64]

5. A Critical Evaluation

The Japanese system for compensation of nuclear damage has a few striking features which also result from the fact that they did not join any of the international conventions. The imposition of a strict liability regime for nuclear accidents is certainly in line with suggestions in that respect in (law and economics) literature.[65] However, it is clear that the Act on Compensation for Nuclear Damage had, as the Act states itself, mainly as goal to reconcile the interests of potential victims and the nuclear industry. There is according to the literature a long tradition of interconnections between industry and bureaucracy in Japan as a result of which it should be no surprise that the nuclear industry has been successful in communicating its wishes to the legislator.[66]

A positive feature of the compensation system in Japan is undoubtedly the unlimited liability of the operator of the nuclear power plant. International conventions and many national laws often have so-called financial caps on the liability of the nuclear operator which is hence qualified as a subsidy.[67] However, it is not so clear to what extent the unlimited liability truly leads to a full externalization of the nuclear accident costs. In a recent article Mark Ramseyer is very critical and holds that earthquakes are so common in Japan that TEPCO basically decided to build its reactor at the site which is vulnerable to earthquake risks because it would not pay the full costs of a meltdown anyway.[68] He holds that a nuclear operator is, also under the Japanese system, still able to externalize liability since liability will *de facto* still be capped at the value of its assets.

One particular striking aspect of the Fukushima case is of course that TEPCO had apparently placed its back-up generators in the basement of the turbine building, as a result of which the nuclear power plant would be without a cooling system in case of a disaster. It may not immediately be clear to what extent this can be blamed either to TEPCO itself as operator or to General Electric, who designed the Fukushima plant. If it would be held that the wrongful placement was due to negligence on the side of General Electric a painful aspect of the nuclear liability regime (in Japan, but also worldwide) becomes clear, being the channelling of liability: according to the Japanese Act on Compensation only the operator of the nuclear power plant can be held liable, thus excluding liability of other potential parties that contributed to the risk, like in this particular case perhaps General Electric. This channelling of liability has been largely criticized in the literature.[69] The economic literature argues that nuclear suppliers, transporters and other parties may also be responsible for nuclear damage. Since some of these parties, especially the transporters, may have serious risks of insolvency, a proposal was made to make operators and suppliers (transporters) jointly and severally liable. Under such a proposal, the insolvency problem would be alleviated and those other parties will have incentives for mutual monitoring.[70]

62 See Michael G. Faure & Tom Vanden Borre, 'Compensating Nuclear Damage: A Comparative Economic Analysis of the US and International Liability Schemes', Volume 33, p. 267-268, 277-278; *WM & Mary Envtl. L. & Pol'y Rev.* 219; Norbert Pelzer, 'International Pooling of Operators' Funds: An Option to Increase the Amount of Financial Security to Cover Nuclear Liability?', Volume 79, p. 46-49 *Nuclear Law Bulletin* 37 (2007).

63 http://www.economist.com/node/21536600 (last visited Mar. 10, 2012).

64 http://www.japantoday.com/category/commentary/view/should-tepco-continue-to-exist (last visited Mar. 10, 2012).

65 *See* Michael G. Faure & Roger Van den Bergh, 'Liability for Nuclear Accidents in Belgium from an Interest Group Perspective', 10 *Int'l Rev. L. & Rev.* 241 (1990).

66 On these relations between industry and bureaucracy, *See* W. Grimes, 'Reassessing Amakudari: What do we know and how do we know it?', 31 *Journal of Japanese Studies* 385 (2005).

67 On this subsidy, *See* Michael G. Faure & Karine Fiore, 'An Economic Analysis of a Nuclear Liability Subsidy', 26 *Pace Envtl. L. Rev.* 419 (2009).

68 For an analysis of this accident *see* J. Mark Ramseyer, *Why Power Companies Build Nuclear Reactors on Fault Lines: The Case of Japan 1*, p. 18-19 (Harvard John M. Olin Centre for Law, Economics and Business, Disc. Paper No. 698, 2011), available at: http://www.law.harvard.edu/program/olin_centre (last visited Mar. 10, 2012).

69 *See* Tom Vanden Borre, 'Channeling of Liability: A Few Juridical and Economic Views on an Inadequate Legal Construction', in: *Contemporary developments in nuclear energy law: harmonizing legislation in CEEC/NIS* p. 13-39 (Nathalie L.J.D. Horbach ed., 1999).

70 Akihiro Watabe, 'An Economic Analysis of Nuclear Accidents in Japan', in: *Perspectives on international state and local economics*, p. 209, 225 (Gerald V. Liu ed.,

A critical analysis of the development of the nuclear industry has shown that the lacking safety of the nuclear industry in Japan can be explained from a private interest perspective. As discussed earlier, since nuclear operators are protected under the principle of limited liability in corporate law, they only have to pay for the potential losses up to their own assets. Thus TEPCO has chosen to build their reactors at the sites vulnerable to earthquake risks. The question can then be asked why government has allowed such a choice of site and failed to order a more tsunami-resistant construction and renovation. The bureaucrats and politicians are supposed to serve the public interest and guarantee a better nuclear safety. However, this is not always the case. The bureaucrats are also profit maximisers and seek their own benefits. Nuclear regulation is public good for the public who needs better nuclear safety, but it is a private good for the nuclear industry. Thus the nuclear industry has more incentives than the public to lobby for lax oversight.[71] Considering the inefficiency of limited liability under the private ownership of nuclear installations, government ownership might be an alternative. However, literature also shows that government ownership may be inefficient as a result of regulated electricity prices, Not In My Back Yard policy and the progressive tax regime.[72]

6. Comparison to the International Regime

Two international treaty regimes regulate the civil liability for damage caused by nuclear accidents.[73] The first treaty regime was established under the auspices of the OECD NEA and consists of the convention on third party liability in the field of nuclear energy of 29 July 1960 (the Paris Convention) and the Brussels Supplementary Convention to the Paris Convention on Third Party Liability in the Field of Nuclear Energy of 31 January 1963 (the Brussels Supplementary Convention). The second nuclear liability treaty regime was developed under the auspices of the International Atomic Energy Agency (IAEA): the Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963. The international regime is characterized by a strict liability of the operator, a strict channelling of liability of the operator, a financial limit (cap) on liability, compulsory insurance and government support. These international regimes have been commented on in detail in legal literature and have also been the subject of a lot of critique.[74]

Japan adopted some similar principles as those of the international regimes of nuclear liability, such as strict liability, channelling of liability to operators and compulsory financial security. But there are many differences as well.

The first difference lies in the definition of nuclear damage and the use of the administrative system. The international regime gives a more detailed definition of nuclear damage. For example, under the second generation of nuclear liability conventions, nuclear damage contains loss of life or personal injury, property damage, consequential economic loss from personal injury and property damage, costs of environment reinstatement, loss of income from use or enjoyment of the environment and the costs of preventive measures.[75] However, in Japan, the definition about nuclear damage is quite simple and is silent on what type of damage is compensable.[76] Thus what composes "nuclear damage" depends on the general tort rules and the application in practice. In Japan the judicial system is not that favourable to nuclear victims because of the difficulties in proving causation and the judges' favourable attitude towards the nuclear industry, as discussed above. On the contrary, most disputes are solved through negotiations and settlements under guidance of the administrative system. The Dispute Reconciliation Committee plays an important role in determining the scope of compensable damage. The question can be asked whether compensating victims via such an administrative system takes place on the basis of specific criteria and hence leads to predictability of the compensation. When looking at the compensation experiences for nuclear damage in Japan, one can find consistency in the determinations by the Dispute Reconciliation Committee. During the compensation for damage for the JCO and Fukushima accidents, the Committee adopted similar standards in awarding the compensation. The compensable scope in the Fukushima accident is broader, but this is understandable since the latter has a much more significant off site impact and experience is still aggregated during the compensation process. If the administrative system keeps operating consistently and develops predictable and clear standards in determining the compensable damage, the administrative system can even ensure better compensation for nuclear victims and give the nuclear industry perhaps more incentives to internalize their full costs than the tort system. A predictable administrative compensation system is possible in Japan. Actually, Japan has a long history in compensating pollution victims through an administrative system.[77] Admittedly, the administrative scheme may not always guarantee

2006).

71 Ramseyer, *supra* note 67, at p. 19.

72 Id, 23.

73 *See*: *Nuclear Energy Agency, Liability and compensation for nuclear damage: an international overview* (OECD 1994).

74 *See* Tom Vanden Borre, 'Shifts in Governance in Compensation for Nuclear Damage: 20 Years after Chernobyl', in: *Shifts in compensation for environmental damage*, p. 261 (Michael Faure & Albert Verheij eds., 2007).

75 2004 Paris Convention, Article I (vii).

76 Act on compensation, section 2 (2).

77 For the introduction of the administrative compensation scheme for pollution victims in Japan, *see* A. Morishima, 'Environmental Liability in Japan', in: *Modern trends in tort law, Dutch and Japanese law compared*, p. 183, 191-193 (Ewoud Hondius ed. 1999).

efficient compensation. The investigation procedure needs to be more transparent and the standards used to indentify compensable damage need to be consistent. Hence, some combined use of the administrative system and the tort system in Japan may be desirable.

Japan also channelled the liability to the operator of the nuclear power plant. This channelling only takes place under the Act on Compensation for Nuclear Damage of 1961. However, unlike in the international regime there may still be other possibilities in Japanese law which could lead to the liability of either the operator or other liable parties in addition to the liability based on the Act on Compensation for Nuclear Damage.[78] Moreover, the Fukushima case provides an excellent example of the problematic nature of the channelling of liability. The first reports on the Fukushima case made clear that the meltdown of the nuclear reactors may have been caused by the simple fact that the generators for the cooling system were located in the basement of the turbine buildings, which of course made them very vulnerable to a tsunami. The question could be asked whether this is indeed the result of an action of the operator TEPCO or rather a result of a wrongful design by General Electric. In the latter case a channelling of the liability to the operator TEPCO would be particularly problematic since channelling would lead to an exclusion of liability of all other parties who contributed to the risk, in this particular case (at least potentially) General Electric. Channelling may thus negatively affect incentives of other parties involved in the risk. In that sense the Fukushima case can once more provide an important back up for the general criticism formulated on channelling.

As to the second aspect, the amount of compensation, the Japanese regime set the required financial security at 120 billion yen. Under the international regime the total amount available (including state aid) was € 381 million under the old regime and will merely be € 1.5 billion when the modification protocol of the Paris and Brussels Convention of 2004 would enter into force. Thus the amount in Japan is set substantially higher than the first generation of the international regime, but similar to the second generation of the international regime and lower than the US regime. As discussed above, though no preset cap on liability exists in the Act on Compensation, the limited liability under corporate law may prevent the nuclear industry to internalize the full costs they cause. Under this situation, sufficient financial security is necessary to guarantee efficient costs internalization. However, the amount of 120 billion yen set in the Japanese system is dwarfed by the huge damage caused by the Fukushima accident. The analysis based on a private interest approach has shown that government and judges may not have incentives to impose a stringent nuclear liability on operators. Nevertheless, the Fukushima accident shows that it remains important to set the financial security at a sufficiently high level to cover the total accident costs.

Thirdly, as far as the financing is concerned, Japan also seems to do better than the international regime. Currently, of the total amount available under the international regime, for example in France € 381 million, only € 91 million would consist of operator's liability, whereas the remaining € 290 million would consist of state aid.[79] In Japan this amount of 120 billion yen is in principle paid by the operator, either (in the general case) via liability insurance or, in case of uninsurable risks (more particularly damage resulting from earthquakes, tsunamis or volcanoes) via an indemnity agreement with the government. But the indemnity agreement is, unlike the state aid in the international regime, not a subsidy, since the operator has to pay a fee for the coverage provided by government via the indemnity agreement. Of course one could question whether the fee paid by the operator via the indemnity agreement is comparable to commercially risk dependent premiums that would be charged on a commercial insurance market. One report shows that in 1998, the premium rate was set at 7.9 percent of the coverage,[80] which is substantially higher than the rate of the indemnity fee (0.3% or 0.15%). However, it should be borne in mind that given the lack of actuarial data for nuclear accidents, the commercial premium is usually set higher than the actuarial premium. Thus the difference between the rate of indemnity fee and actuarial premium may not be that large. On the positive side, at least in Japan some money is asked from the operator for the government indemnity, whereas in the international regime the state aid is provided for free. Therefore less subsidy is given under the Japanese system. Moreover, unlike in the international regime there is in Japan in principle unlimited liability of the operator also above the amount of 120 billion yen, for which the operator needs to seek either liability insurance or an indemnity agreement. Hence, the Japanese system has less of a subsidy effect than the international regime and hence better prospects of cost internalization by the operator.

It is worth noting that the advantages of the Japanese system in financing compared to the international regimes do not mean

78 For a detailed analysis of the other potential sources of liability under Japanese Law, *see* Weitzdörfer, *supra* note 5, at p. 87-101. There may for example still be claims possible on the basis of property law, but also under labour law or social security law. Also the possibility of state liability can still be examined, according to Weitzdörfer.

79 Even after the entry into force of the modification protocol of 2004, of the total amount of € 1.5 billion only € 700 million would be operator's liability and a remaining € 800 million would still be state aid.

80 Akihiro Watabe, *supra* note 69, 222.

that there is no subsidy to the nuclear industry at all. The above description of the newly founded Nuclear Damage Compensation Facilitation Corporation shows that an ex post risk sharing agreement is established in Japan. In such a system, both TEPCO and other nuclear operators are asked to contribute to the Corporation, which helps and promotes compensation for nuclear victims. This seems similar to the US system where retrospective premiums are asked from operators. It is held that this system can give operators incentives to monitor each other and improve nuclear safety. At this stage it is not clear yet how the various nuclear operators will contribute to the Corporation. The system is, moreover, only established after the Fukushima-incident took place. Hence, such an ex post system may fail to create incentives for nuclear operators for mutual monitoring. Besides, the government also helps the compensation through the issuance of government bonds and government guaranteed bonds. Those instruments can lead to a subsidy as well.

7. Concluding Remarks

The Fukushima incident which followed the 11 March 2011 earthquake and tsunami will undoubtedly still be discussed for many years. A few days after the devastating tsunami it became clear that this tidal wave had caused the failure of the emergency diesel generators for the cooling system in the nuclear power plant at Fukushima, thus leading to a meltdown in various reactors. Hence, Japan was confronted with a unique combination of a natural and a technological disaster with spectacular damage and thus questions concerning the compensation of victims.

Even though Japan never joined the international conventions, it can certainly not be argued that Japan would fall short of the level of protection awarded to victims via the international conventions. On the contrary, it could even be held that the Japanese model to compensate victims of nuclear accidents may provide lessons for the international community.

The operator's duty to seek financial guarantees up to a certain amount is supplemented with unlimited liability. Moreover, the indemnity agreement with the government involves the payment of a fee by the operator for the compensation that will be provided by government. This provides the important lesson that state intervention in the compensation of catastrophes should not (as is often the case) be provided for free. Charging a price for government intervention has the major advantage that a subsidy-effect is avoided and that a better cost internalization can take place.

Of course questions can still be asked about whether either the compensation system for nuclear liability will be able to provide full compensation to the victims. It may, as yet, be too early for such a final assessment, since not all the damage can be known yet. But the Fukushima case again shows that a careful design of the compensation regime of catastrophic risks is important, not only in the light of providing adequate compensation for victims, but also as an instrument to provide incentives for prevention. The mere fact that the Fukushima incident may have been caused not only by the operator's wrongful behaviour but probably by a design failure as well, again shows the problematic nature of an exclusive channelling of liability to the operator. Therefore excluding liability of all others who could have contributed to the risk, such as those who designed the installation of the diesel generators for cooling pumps below the reactors, can create inefficient preventive incentives.

Studying the compensation for victims of the nuclear incident at Fukushima in Japan is therefore undoubtedly not only interesting for those directly involved in the compensation of victims, but can provide yet another alert to the international community that the (inefficient) design of some of the international conventions needs to be seriously re-examined.